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IN THE CLAIMS

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Claim 1 (original): A method of determining the blood flow rate Q_F in a blood-carrying line (40), of which blood a portion is branched off at a first location (12) through an arterial line (14) and through a venous line (15) and is returned at a second location (13), whereby

a physicochemical variable Y of the blood, which is constant over a period of time for a measurement interval, is determined in the arterial line (14) as having the value Y_A and is determined in the venous line (15) as having the value Y_V,

the net rate dX/dt of a variable X derived from the physicochemical variable Y into or out of the blood-carrying line (40) during the measurement interval is determined from the values Y_A and Y_V as the difference between the rate dX_A/dt removed through the arterial line (14) and the rate dX_V/dt supplied through the venous line (15), and

the net rate dX/dt is used to determine the blood flow rate Q_F.

Claim 2 (original): The method according to Claim 1, characterized in that the blood flow rate Q_B is determined in the arterial line (14) and in the venous line (15) for the determination of the rate removed dX_A/dt and the rate supplied dX_V/dt.

Claim 3 (original): The method according to Claim 2, characterized in that the physicochemical variable Y is the thermal energy per unit of volume of blood, and the variable X, which is derived from it, denotes the thermal energy E of the blood in the blood-carrying line (40).

Claim 4 (original): The method according to Claim 3, characterized in that the temperatures T_A in the arterial line (14) and T_V in the venous line (15) are determined for the determination of the net thermal energy rate dE/dT, and the net energy rate is determined on the basis of the equation

$$\frac{dE}{dt} = \frac{dE_V}{dt} - \frac{dE_A}{dt} = c_E \rho_B Q_B (T_V - T_A)$$

where c_E is the specific thermal capacity and ρ_B is the density of the blood.

Claim 5 (original): The method according to Claim 2, characterized in that the physicochemical variable Y is the concentration c of a substance in blood, and X is the quantity C of the substance in the blood-carrying line (40).

Claim 6 (original): The method according to Claim 5, characterized in that the concentrations c_A of the substance in the arterial line (14) and c_V in the venous line (15) are determined for the determination of the net substance quantity rate dC/dt, and the net substance quantity rate is determined according to the equation:

$$\frac{dC}{dt} = \frac{dC_V}{dt} - \frac{dC_A}{dt} = Q_B (c_V - c_A)$$

Claim 7 (currently amended): The method according to Claim 1 ~~one of the preceding Claims~~, characterized in that the arterial line (14) branches off from the blood-carrying line (40) upstream from the venous line (15), and the blood flow rate Q_F is determined on the basis of the equation:

$$Q_F = \frac{\frac{dX}{dt}}{Y_V - Y_B}$$

where Y_B is the physicochemical variable in the blood-carrying line (40) upstream from the branch (12) in the arterial line (14).

Claim 8 (currently amended): The method according to Claim 2 ~~one of Claims 2 through 6~~, characterized in that the arterial line (14) branches off from the blood-carrying line (40) downstream from the venous line (15), where the net rate is designated as dX_{rec}/dt, and the physicochemical variable in the venous line is designated as $Y_{V,rec}$, and the blood flow rate Q_F is determined on the basis of the equation:

$$Q_F = \frac{Q_B \frac{dX_{rec}}{dt}}{Q_B(Y_{V,rec} - Y_B) - \frac{dX_{rec}}{dt}}$$

where X_B is the physicochemical variable in the blood-carrying line (40) upstream from the branch (13) in the venous line (15).

Claim 9 (currently amended): The method according to Claim 2 ~~one of Claims 2 through 6~~, characterized in that both the net rate dX/dt with the upstream branch in the arterial line (14) relative to the venous line (15) from the blood-carrying line (40) as well as the net rate dX_{rec}/dt with a downstream branch in the arterial line (14) relative to the venous line (15) from the blood-carrying line (40) are determined at the same blood flow rate Q_B, and the blood flow rate Q_F is determined according to the following equation:

$$Q_F = \frac{Z}{1-Z} Q_B \quad \text{where} \quad Z = \frac{\frac{dX_{rec}}{dt}}{\frac{dX}{dt}} \frac{Y_V - Y_A}{Y_{V,rec} - Y_A}.$$

Claim 10 (currently amended): A device for measuring the blood flow in ~~the~~ a blood-carrying line (40), comprising

an arterial line (14) branching off from the blood-carrying line (40) with which blood is removed from the blood-carrying line;

a venous line (15) opening into the blood-carrying line (40) with which blood is supplied to the blood-carrying line;

arterial measurement means (20) and venous measurement means (22) for determining a physicochemical variable Y of the blood in the arterial line (14) with the value Y_A and in the venous line (15) with the value Y_B, these variables being constant over a period of time for a measurement interval;

an analyzer unit (27) connected to the arterial measurement means (20) and the venous measurement means (22), this analyzer unit being suitable for determining the net rate dX/dt of a variable X derived from the physicochemical variable Y into or from the blood-carrying line (40) during the measurement interval as the difference between the rate dX_A/dt removed through the arterial line (14) and the rate dX_V/dt supplied through the venous line (15) from the values Y_A and Y_V, and it is also suitable for using the net rate dX/dt to determine the blood flow rate Q_F.

:laim 11 (original): The device according to Claim 10, characterized in that means (18) are provided for detecting and/or adjusting the blood flow rate Q_B in the arterial line (14) and in the venous line (15).

laim 12 (original): The device according to Claim 11, characterized in that the means for detecting the blood flow rate Q_B consist of a flow sensor, which is connected to the analyzer unit (27).

laim 13 (original): The device according to Claim 12, characterized in that the means for detecting the blood flow rate Q_B consists of a control unit (18) which is used for setting a delivery rate of a blood pump (16), which is situated in the arterial line (14) and/or the venous line (15) and is connected to the analyzer unit (27).

:laim 14 (currently amended): The device according to Claim 11 ~~one of Claims 11 through 13~~, characterized in that the physicochemical variable Y denotes the thermal energy per unit of volume of blood, and the variable X derived therefrom denotes the thermal energy E of the blood in the blood-carrying line (40).

laim 15 (original): The method according to Claim 14, characterized in that the measurement means (20, 22) in the arterial line (T_A) and the venous line (T_V) are temperature sensors for determining the net thermal energy rate dE/dt, and the analyzer unit (27) is suitable for determining the net thermal energy rate by using the equation:

$$\frac{dE}{dt} = \frac{dE_V}{dt} - \frac{dE_A}{dt} = c_E \rho_B Q_B (T_V - T_A)$$

where c_E is the specific thermal capacity, and ρ_B is the density of blood.

Claim 16 (currently amended): The device according to Claim 11 ~~one of Claims 11 through 13~~, characterized in that the physicochemical variable is the concentration c of a substance in the blood, and X is the quantity C of this substance in the blood-carrying line (40).

laim 17 (original): The device according to Claim 16, characterized in that to determine the net substance quantity dC/dt, the measurement means (20, 22) in the arterial line (c_A) and in the venous line (c_V) are concentration sensors, and the analyzer unit (27) is suitable for determining the net substance quantity rate on the basis of the equation:

$$\frac{dC}{dt} = \frac{dC_V}{dt} - \frac{dC_A}{dt} = Q_B(c_V - c_A)$$

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Claim 18 (currently amended): The device according to Claim 10 ~~one of Claims 10 through 17~~, characterized in that the blood-arterial line (14) branches off from the blood-carrying line (40) upstream from the vinous line (15), and the analyzer unit (27) is suitable for perfoming a determination of the blood flow rate Q_F on the basis of the equation:

$$Q_F = \frac{\frac{dX}{dt}}{Y_V - Y_B}$$

where Y_B is the physicochemical variable in the blood-carrying line (40) upstream from the branch (12) in the arterial line (14).

Claim 19 (currently amended): The device according to Claim 11 ~~one of Claims 11 through 17~~, characterized in that the arterial line (14)

branches off from the blood-carrying line (40) upstream from the venous line (15), whereby the net rate is designated as dX_{rec}/dt and the physicochemical variable in the venous line is designated as $Y_{V,rec}$, and the analyzer unit (27) is suitable for performing a determination of the blood flow rate Q_F by using the equation:

$$Q_F = \frac{Q_B \frac{dX_{rec}}{dt}}{Q_B (Y_{V,rec} - Y_B) - \frac{dX_{rec}}{dt}}$$

where Y_B is the physicochemical variable in the blood-carrying line (40) upstream from the branch (13) and in the venous line (15).

Claim 20 (currently amended): The device according to Claim 11 ~~one of Claims 11 through 17~~, characterized in that the analyzer unit (27) is suitable for determining both the net rate dX/dt with an upstream branch in the arterial line (14) with respect to the venous line (15) from the blood-carrying line (40) as well as the net rate dX_{rec}/dt with a downstream branch in the arterial line (12) with respect to the venous line (15) from the blood-carrying line (40) at the same blood flow rate Q_B, and then from that determining the blood flow rate Q_F according to the following equation:

$$Q_F = \frac{Z}{1-Z} Q_B \quad \text{where} \quad Z = \frac{\frac{dX_{rec}}{dt}}{\frac{dX}{dt}} \frac{Y_V - Y_A}{Y_{V,rec} - Y_A}.$$

Claim 21 (currently amended): The device according to Claim 10 ~~one of Claims 10 through 20~~, characterized in that the arterial line (14) and the venous line (15) are part of an extracorporeal blood circulation system (2) of a blood treatment device.

Claim 22 (original): The device according to Claim 21, characterized in that the blood treatment device is a hemodialysis device.

Claim 23 (currently amended): The device according to Claim 21 ~~Claims 21 or 22~~, characterized in that the blood flow rate Q_F to be determined is the blood flow in a blood vessel, in particular an arteriovenous fistula or a shunt, in a patient.

Claim 24 (currently amended): The device according to Claim 10 ~~one of Claims 10 through 23~~, characterized in that device has a display unit (28) suitable for displaying the blood flow rate Q_F.